MONTANA TOTAL JURISDICTION PRISON POPULATION PROJECTIONS

by

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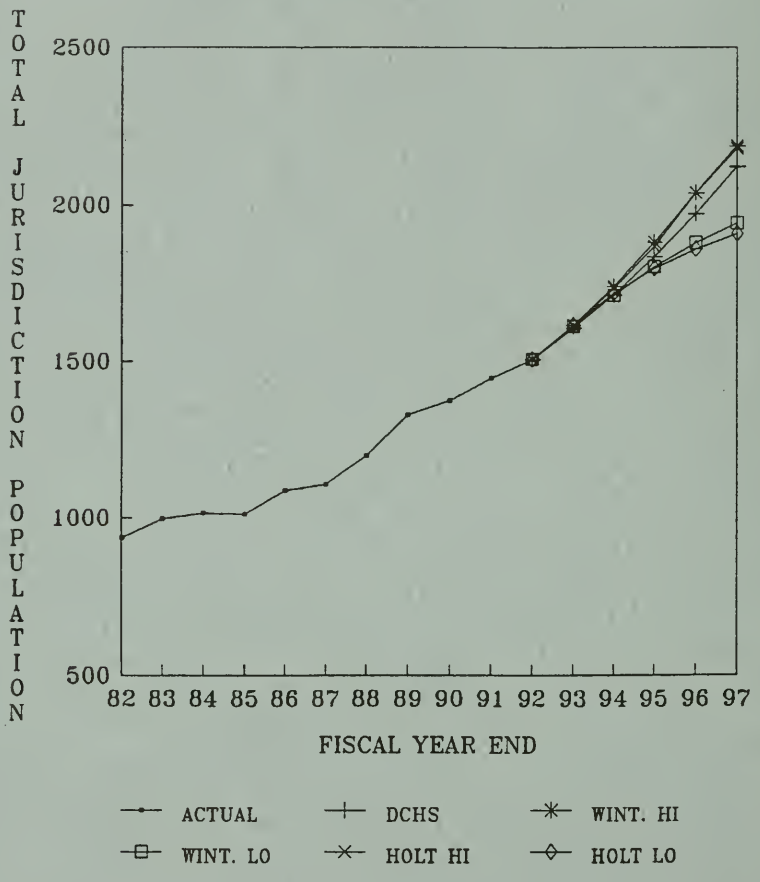
Montana Board of Crime Control

PROJECTED MALE PRISON POPULATIONS
DCHS, WINTER'S AND HOLT METHOD INPUT



IMPACT GENERATED PROJECTIONS

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INTRODUCTION

Montana Corrections has generated prison population projections using **IMPACT**, a projection program developed by the Criminal Justice Research Association. That program was specifically developed to help police and corrections agencies forecast jail and prison populations using replicable and empirical methods. Montana Corrections' projections using **IMPACT** have been quite accurate to date. The **IMPACT** routine used generates projections from input comprising the base population count, the current prison length of stay and estimates of future prison admission and future prison length of stay. To date, Corrections has developed estimates of future length of stay and admission by using averages and sets of moving averages of past measures of those variables.

Generation of prison population projections is little different from a game of chance. Projections are "accurate" only for the specific set of assumptions upon which they are based. Corrections has pursued alternative methods of generating projection assumptions in an attempt to strengthen their applicability to the reality that is driving corrections population growth. Those methods are contained in Forecast Pro, an event forecasting software product developed by Business Forecast Systems, Inc. Forecast Pro offers sophisticated statistical analyses and projections of measurable time series data. The projection methods the product provides (three forms of exponential smoothing,

dynamic regression and Box-Jenkins analyses) are considered by forecasting experts to be among the most powerful and reliable available for general applications. The Forecast Pro program not only provides alternative forecast methods but also recommends a method based upon analyses of the input data series. This product was used to generate alternative estimates of future prison admissions and future prison length of stay.

METHODOLOGY AND ASSUMPTIONS

Estimates of future prison admissions and future prison length of stay were generated using DCHS methodology and using two forms of exponential smoothing. Separate estimates were developed for males and females. Exponential smoothing techniques were chosen over the Box Jenkins method because Forecast Pro recommended exponential smoothing and because Box-Jenkins predicted declines in both variables. A review of the past distribution of those variables and of the public policy and socioeconomic environments of the state is sufficient to discount the applicability of Box-Jenkins results for these variables.

1. DCHS methodology. Estimates of future prison admissions are based on the average number of admissions in the three most recent years, inflated at a rate equal to the average of four sets of moving averages of the annual increases in that variable. "Long" length of stay admissions are subtracted from the base and projected separately. Estimates of future length of stay are based on fiscal year end actual length of stay inflated at a rate equal to the average of four sets of moving averages of the annual increases in that variable.

2. Exponential smoothing. This method has been described as among the most widely used, accurate, robust and adaptive of forecast techniques. Exponential smoothing is recommended when correlational relationships are unstable or absent from the data. The **Forecast Pro** program recommended use of exponential smoothing techniques for admissions and length of stay data. High range and low range forecasts were generated using Winter's 3 Parameter and Holt 2 Parameter exponential smoothing methods. Both methods permit use of input data subjected to logarithmic transformations; both permit "damping" of trend effects. "Damping" gradually converts the trend component within a data distribution to a constant level. Logarithmic transformations of data reduce their variability. Forecasts were generated with and without "damping" and with and without logarithmic transformations of the data. The Winter's and Holt methods differ primarily in the assumption of a seasonality component within the data in the Winter's model.

   Winter's high projections of male admissions were generated using a logarithmic transformation of prior admissions. The Winter's low projection was generated using transformed data and "damped" trends. The Holt high male admissions estimate also was generated using a logarithmic transformation; the low estimate was generated with "damped" trends and no transformation of data. There was little difference in estimates of female admissions within the alternative Winter's methods. The Holt high female

admissions estimate was developed using a data transformation and "damped" trends. The Holt low female admission estimate was derived using the logarithmic transformation only. The "expert system" program within Forecast Pro recommended use of Winter's methods for estimation of future male and female prison admissions.

High estimates of future male and female prison length of stay using Winter's and Holt methods were generated with transformed data, without trend damping. Low estimates of that variable, for both sexes, were generated without logarithmic transformations of the data but with trend "damping", using Winter's and Holt methods. The "expert system" recommendation was that Winter's methods be used for male length of stay and that Box-Jenkins be used for female length of stay. As stated earlier, Box-Jenkins was not used because that method's results defy existing trends.

RESULTS

Forecast Pro projections of male and female prison admissions are presented in Table 1 in comparison to DCHS projections.

Note that, with the exception of estimates of female prison admissions, the results of forecasts using Winter's and Holt methods are quite congruent. Note also that DCHS estimates of male prison admissions and length of stay occupy the mid-point between the high and low estimates of those variables using Winter's and Holt methods. This is not the case with estimates of female admission and length of stay, where DCHS estimates are substantially

Table 1. Alternative projections of future prison admissions, by method. FY 1993 - 1997

Method	Fiscal Year 1993	1994	1995	1996	1997
Males					
DCHS	604	626	649	673	697
Winter's High	619	639	658	679	691
Winter's Low	612	624	633	640	645
Holt High	618	637	657	689	700
Holt Low	622	636	643	648	652
Females					
DCHS	52	57	61	65	70
Winter's High	50	50	50	50	50
Winter's Low	48	48	48	48	49
Holt High	51	52	56	57	60
Holt Low	48	48	49	52	52

Table 2. Alternative projections of future prison length of stay, in months, by method. FY 1993 - 1992

Method	Fiscal Year 1993	1994	1995	1996	1997
Males					
DCHS	35.3	36.2	37.0	37.9	38.8
Winter's High	36.0	37.5	39.1	40.7	42.3
Winter's Low	35.8	36.4	36.8	37.0	37.1
Holt High	35.7	37.0	38.2	39.5	40.9
Holt Low	35.1	35.2	35.2	35.2	35.2
Females					
DCHS	18.8	20.9	23.2	25.8	28.7
Winter's High	18.8	19.9	21.2	22.5	23.9
Winter's Low	17.6	18.0	18.3	18.5	18.7
Holt High	17.9	18.5	19.1	19.7	20.3
Holt Low	17.5	17.7	18.0	18.2	18.4

Table 3. Projected male and female total jurisdiction prison populations. FY 1993 - 1997

Method	Fiscal Year End 1993	1994	1995	1996	1997
Males					
DCHS	1608	1714	1836	1973	2121
Winter's High	1617	1741	1881	2038	2187
Winter's Low	1614	1712	1803	1879	1942
Holt High	1615	1734	1868	2039	2178
Holt Low	1617	1719	1799	1859	1908
Females					
DCHS	84	94	109	129	156
Winter's High	81	83	87	93	99
Winter's Low	79	78	78	79	81
Holt High	82	83	90	95	104
Holt Low	79	77	79	84	85

greater than those generated using Winter's and Holt methods. Presumably, this is due to the volatility of recent trends in female admissions and length of stay.

Forecast Pro estimates of future male and female prison length of stay are displayed in Table 2 in comparison to DCHS projection.

IMPACT generated projections of male and female total jurisdiction prison populations are presented in Table 3. The projections differ as a result of different input assumptions - i.e., input data vary as a result of the method chosen to develop them.

DISCUSSION

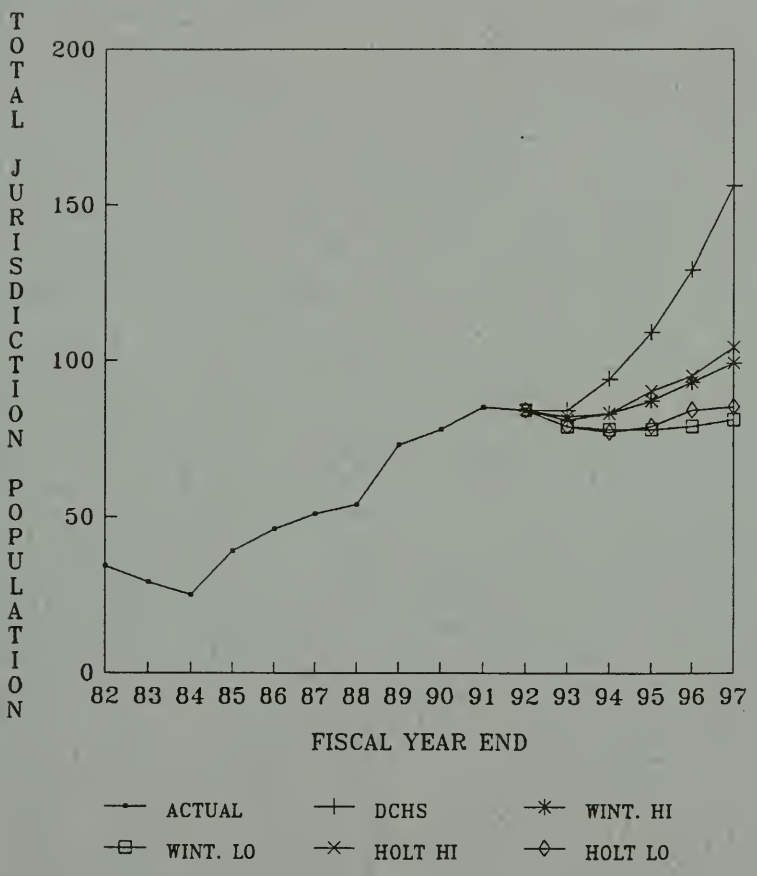
Prison population size is determined by the number of persons sentenced to prison and by the effective length of their sentences. Those variables are controlled, in large measure, by public policy decisions concerning definitions of crime, perceptions of the prevalence of crime and definitions of the appropriate public response to crime. Correctional overcrowding in Montana and elsewhere clearly demonstrates that correctional population size is not the result of some universal, mechanistic social phenomenon.

There are no local indications that the factors determining Montana's correctional population growth are either becoming stable or changing. There is no change notable in political rhetoric concerning crime and punishment. There is no apparent public awareness of the actual prevalence of crime in Montana, of the nature and complexity of correctional programs in Montana or of the effects and costs of criminal justice policy. There is no evidence of press awareness of these factors. In short, there is no reason to suspect any substantial reduction in

the trends that have determined Montana correctional population size in the past decade. If any change appears likely, it is that correctional population growth may accelerate, particularly given the recent contractions in most government service programs.

The projections of male prison populations displayed above may prove to be conservative. Those projections certainly are not exaggerated, unless a substantial change in public policies concerning crime and punishment in Montana occurs in the very near future. It should be noted that correctional populations probably would continue to increase in the near future even if public policy were to become more liberal. The DCHS projection of female prison populations probably is excessive. There have been astounding increases in prison admissions and length of stay within the female population in recent years. It is difficult to believe that those increases will continue unchecked. At the same time, the graph of projected female prison populations suggests that near term growth in that population is apt to be greater than projected using exponential smoothing generated input data. Corrections has arbitrarily assumed that the fiscal year end 1997 female population will number approximately 120 inmates.

PROJECTED FEMALE PRISON POPULATIONS
DCHS, WINTER'S AND HOLT METHOD INPUT



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